

# AGE CONSIDERATIONS IN ELECTIVE SPINE SURGERY INCREASING INDICATION FOR CERVICAL DISC ARTHROPLASTY (CDA)

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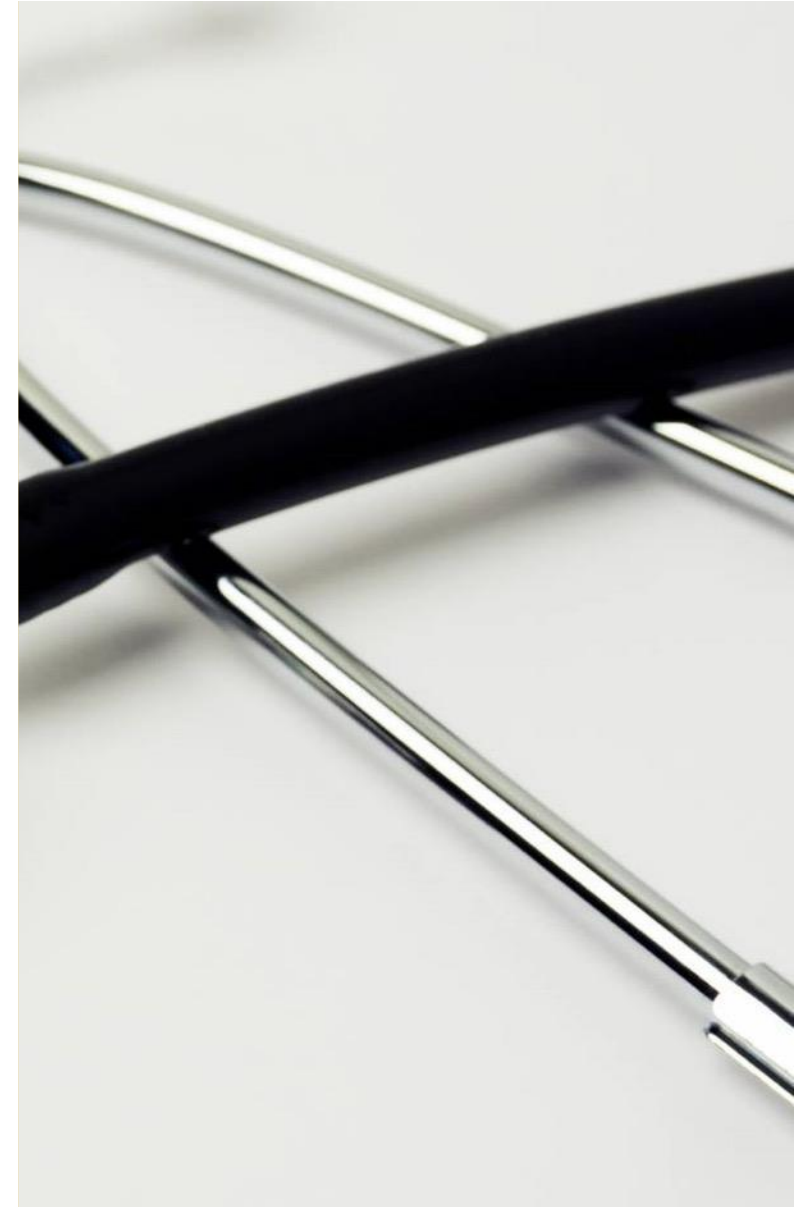
## DISCLOSURES:

I have no relevant financial relationships with ineligible companies to disclose.



# AGENDA

- Adjacent Segment Disease (ASD)
- Trend / Utilization
- Material and Design
- Outcome
- Current Consensus



A photograph of five surgeons in an operating room, all wearing green scrubs, masks, and caps. They are focused on a surgical procedure on a patient's back. The scene is dimly lit, with the primary light source being the overhead surgical lamp. The background shows medical equipment and shelves with supplies.

# ADJACENT SEGMENT DISEASE (ASD)

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# ADJACENT SEGMENT DISEASE (ASD)



- The Debate
  - Caused by surgery?
  - Natural evolution of the degenerative process?
- Hilibrand 1999 – JBJs “*Radiculopathy and Myelopathy at Segments Adjacent to the Site of a Previous Anterior Cervical Arthrodesis*”
  - ASD – clinical syndrome
  - 2.9% annual incidence
  - 25% cumulative incidence – 10 yrs
  - C5-6 and C6-7 levels most common
  - ASD – More common if Pre-existing adjacent level degeneration

# ADJACENT SEGMENT DISEASE (ASD)

- Hilibrand 2004 – The Spine Journal “*Adjacent segment degeneration and adjacent segment disease: the consequences of spinal fusion?*”
  - **ASD**egeneration (Radiographic) vs **ASD**isease (Symptomatic)
  - ACDF vs Posterior Foraminotomy without fusion - similar rate of Adjacent Segment DEGENERATION (Radiographic)
  - Development of Adjacent Segment DIGENERATION ➦ DISEASE
  - Conclusion: Both fusion and natural history of spondylosis causes ASD



## ADJACENT SEGMENT DISEASE

- Recent Studies - Focuses on Surgery as a Cause
  - Eck et al (2002)– Biomechanical cadaveric study
    - adjacent disc intradiscal pressure increased by ~18%
  - Lee, Chapman, et al (2012) –J Spine
    - ASD in congenitally fused segment is less frequent
    - role played by surgery in ASD genesis
  - Kim 2012 – J Spine
    - Anterior Plate to disc distance - <5mm = 50% risk of development of ossification = 2 x ASD risk



A close-up photograph of a young Asian woman, likely a healthcare professional, smiling warmly. She is wearing a white lab coat and a stethoscope. Her hair is pulled back. In the foreground, the back of a person's head is visible, suggesting she is attending to a patient. The background is blurred, showing other people in a clinical or hospital setting.

CURRENT TREND / UTILIZATION



## CURRENT TREND

- ACDF - Utilization plateaued since 2014
- Disc Replacement –  
    ↑ 650% over 10 years
- 2023 - ~15% of anterior cervical disc surgery is a CDA (1 in 7)
- 2023 - ~4.8% of medicare patients with anterior cervical disc surgery had CDA
- CDA procedures in Medicare patients expected to double by 2035 (NASS, 2025)





# MATERIAL AND DESIGN

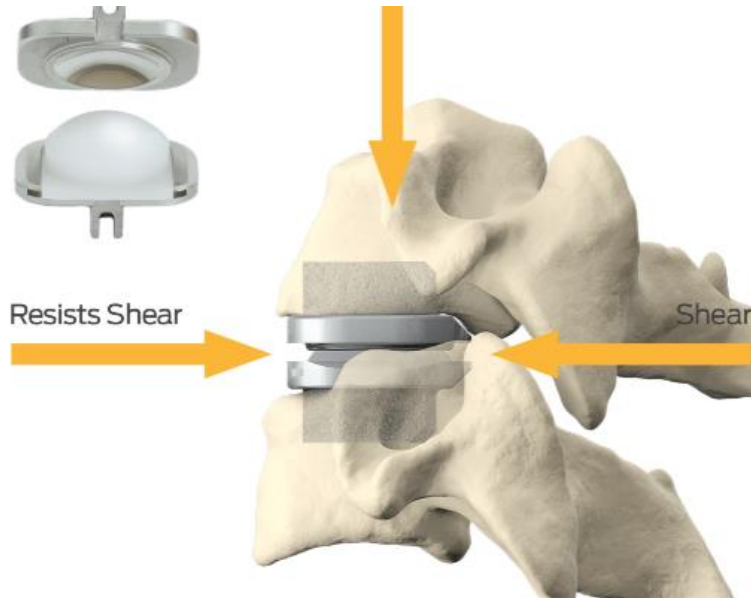
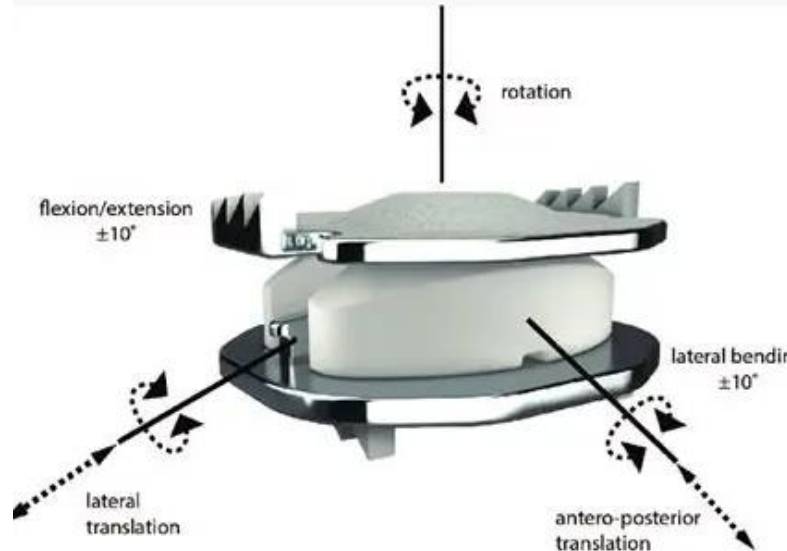
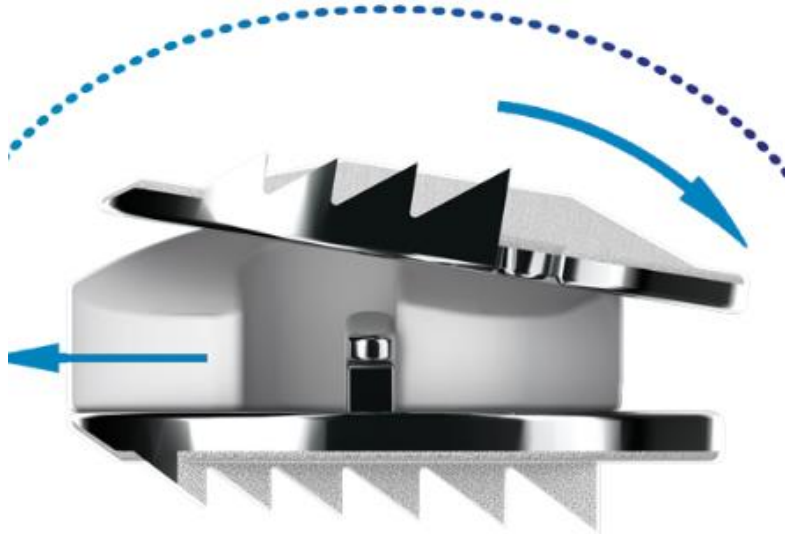
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# MATERIAL AND DESIGN

- Types of Constraint
  - Semi-constrained
  - Unconstrained
- Material
  - Metal on Metal
  - Metal on Poly
  - Viscoelastic
  - Peek on Ceramic
- FDA approved for one level or two levels

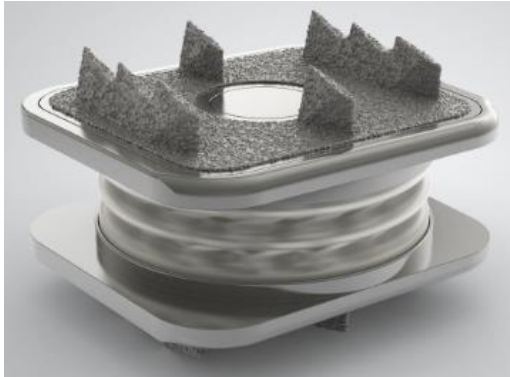






## TYPES OF CONSTRAINT

- Unconstrained
  - 6 Degrees of Freedom (DOF)
  - Mobi-C (top)  
Zimmer/Biomet
- Semi-Constrained
  - < 6 DOF
  - Prodisc-C  
(bottom) Centinel Spine



## MATERIAL

- Viscoelastic
  - M6 (Orthofix) – 2019 - 2 levels (DISCONTINUED-Osteolysis and failure)
- Peek on Ceramic
  - Simplify (Globus) – 2021 – 2 levels
- Metal on Poly
  - Prodisc-C (Centinel Spine) – 2007 – 1 level
  - Mobi-C (Zimmer/Biomet) – 2013 – 2 levels
- Metal on Metal
  - Prestige LP (Medtronic) – 2016 – 2 levels

Type of Constraint	Semiconstrained Models	Prestige	PCM		Simplify
			ProDisc-C		
			Secure C		
	Unconstrained Models		Mobi-C	Bryan	
			Discover	M6	
	Material	MoM	MoP	VC	PoC
	Articulation	Articulating	Articulating	Nonarticulating	Articulating
	Mode of articulation	Ball-in-trough	Ball-and-socket	Single-piece	Ball-and-socket





OUTCOME

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## IS DISC REPLACEMENT BETTER?

- Motion Preservation – Selling Point
- 10 years data –Nunley 2023 / Kim 2020  
Prospective RCT
  - Revision surgery – lower (3-5% vs 10-15%)
  - ASD – lower (10-15%vs 20-35%)
  - Surgery for ASD – lower (3% vs 12%)
  - Greater Improvement – NDI,VAS, SFI2
  - Industry Sponsored





# COMPLICATION

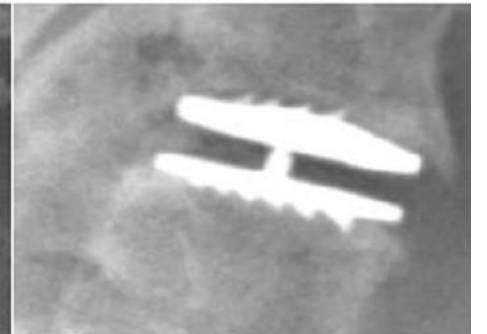
- Heterotopic Ossification (HO) was unusually high in Semi-Constrained implants
  - ~28% showed evidence of HO at one year (grade 1-2)
  - Grade 3-4 HO 8% at one year
- — higher rates reported for longer follow-up (at 10 years)
  - Grade 1-2 = 50%
  - Grade 3-4 = 20%
- Unconstrained (at 10 years)
  - Grade 3-4 – 11-15%



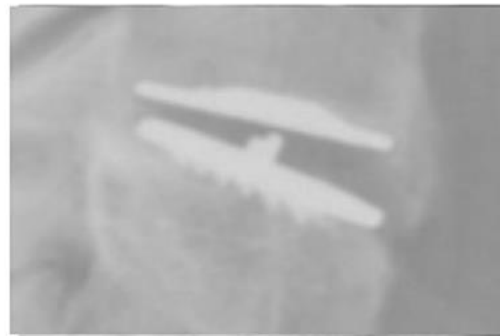
Grade 0



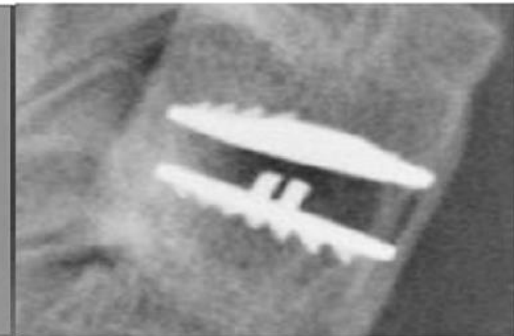
Grade 1



Grade 2



Grade 3



Grade 4



A medical stethoscope with a black tube and silver chest piece is resting on a clipboard. The clipboard has a white form with fields for 'NEW PATIENT REGISTRATION', 'PLEASE PRINT', 'Work Phone', 'Address', 'INSURANCE', and 'Relation to'. A black pen is also on the clipboard. The entire setup is on a light blue surface.

# CURRENT CONSENSUS

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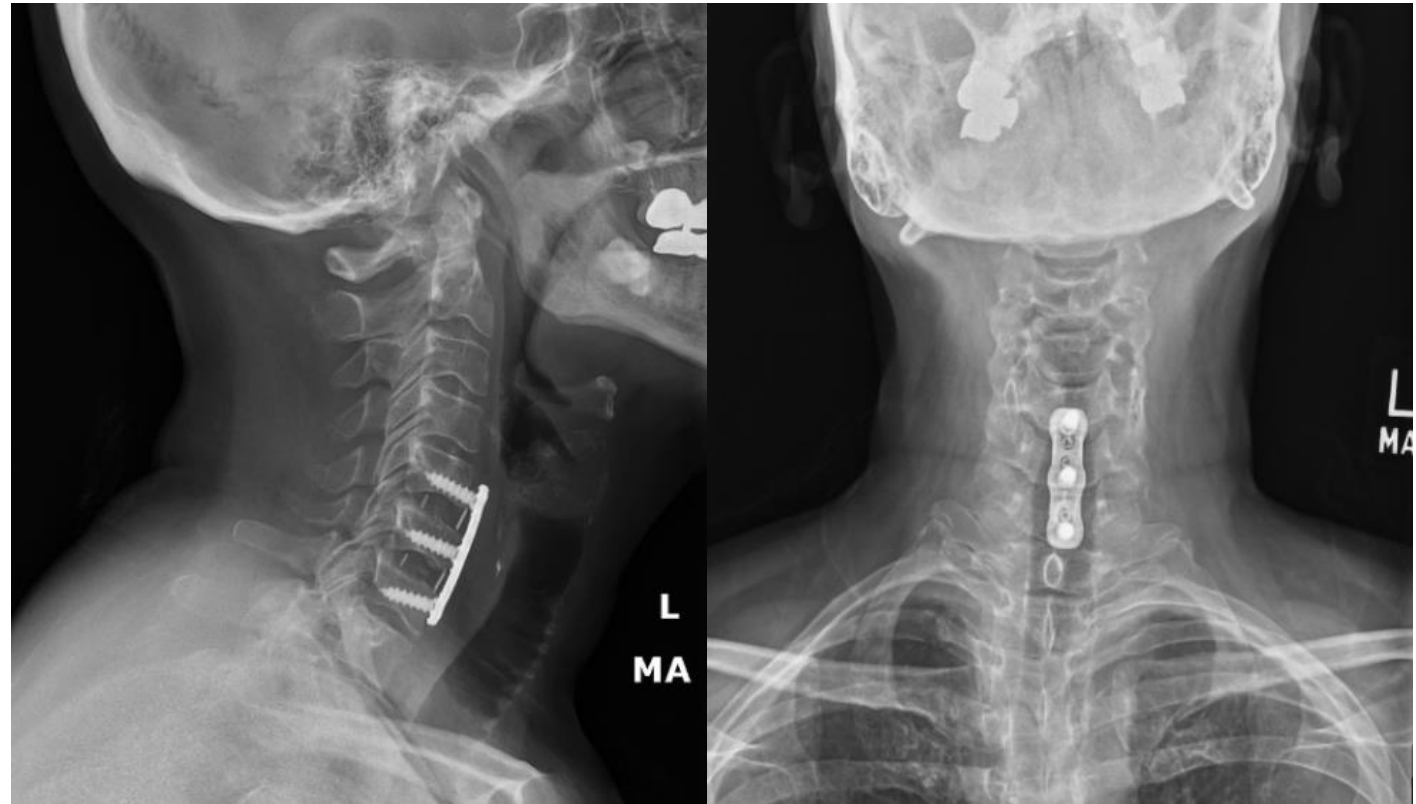
## INDICATION FOR CDR

- 1-2 level disease
- No significant disc degeneration or facet joint arthrosis
- No significant kyphosis
- No instability
- No history of surgery at index level (no posterior foraminotomy)
- No significant osteopenia or osteoporosis
- >65 years old ok if above indications met



## CONCLUSION

- ACDF – gold standard
- Disc Replacement may be better in select group of patients
- Active Patient, Localized Pathology
- Disc disorder without Major Spondylosis
- May Reduce Risk of ASD
- Indications are widening to include Medicare patients





A close-up photograph of a woman with curly brown hair, wearing blue medical scrubs and a stethoscope. She is smiling warmly at the camera. The background is a blurred hospital setting with other people. The text "THANK YOU" is centered over the image in white, with a thin white horizontal line underneath it.

THANK YOU